CLAIMS

1. A composite structure subassembly comprising:

a sheet metal portion having an upper surface and a lower surface; and

a metal foam precursor comprising a mixture of metal powder and a blowing agent disposed on said curvilinear sheet metal.

2. The composite subassembly of Claim 1, wherein said metal powder is a alloy metal powder alloy.

3. The composite subassembly of Claim 2, wherein said sheet metal comprises a material capable of being superplastically formed.

4. The composite subassembly of Claim 1, wherein said sheet metal portion comprises aluminum.

5. The composite subassembly of Claim 2, wherein said sheet metal portion comprises aluminum.

6. A composite structure comprising:

a first curvilinear sheet metal portion; and

a metal foam portion fused to a surface of said curvilinear sheet metal portion.

7. The composite structure of Claim 6, wherein said metal foam comprises an aluminum alloy.

8. The composite structure of Claim 6, wherein said metal foam comprises a plurality of solid metallic microphases.

9. The composite structure of Claim 6, wherein said sheet metal portion comprises aluminum.

10. The composite structure of Claim 6 further comprising a second curvilinear sheet metal portion fused to a surface of the metal foam portion.

11. A method for making a composite structure comprising:

providing a first sheet metal layer;

adhering a metal foam precursor layer to said first sheet metal layer to form a precursor structure, said precursor layer comprising a mixture of metal powder and a blowing agent;

heating said precursor structure to a temperature sufficient for superplastic forming;

forming said precursor structure; and

heating said formed precursor structure to a foaming temperature sufficient to foam said metal foam precursor portion and to fuse the resultant metallic foam to said first sheet metal layer.

12. The method of Claim 11, wherein said metal powder comprises a metal powder alloy.

13. The method of Claim 11, wherein said first sheet metal comprises a superplastically formable material.

14. The method of Claim 12, wherein said first sheet metal portion comprises aluminum.

15. The method of Claim 14 further comprising applying hydrostatic pressure to one side of the metal foam precursor.

16. The method according to Claim 12 further comprising coupling a second sheet metal layer to the foam precursor.

17. A method for making energy absorbing padding for use in vehicles, comprising:

providing a first aluminum sheet metal having a perimeter profile, an upper surface and a lower surface;

adhering a metal foam precursor portion to a surface of said foam sheet to form a first energy absorbing precursor structure, said foam precursor portion comprising a mixture of aluminum powder and a blowing agent of TiH_2;

adhering a second aluminum sheet metal to said metal foam precursor portion to form a second energy absorbing precursor structure;

heating said second precursor structure to between about 450 degrees C and about 600 degrees C;

applying gas pressure to said second energy absorbing precursor structure so as to form said energy absorbing precursor structure to a desired curvilinear shape;

heating said precursor structure to a foaming temperature sufficient to foam said metal foam precursor; and

sustaining the temperature of said precursor structure at foaming temperature for a time sufficient to foam said metal foam precursor portion into a desired shape and to fuse the resultant metallic foam to both said first and said second aluminum metal sheets.